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of some of his shorter works has appeared; and, now that we have a good sketch of his life, English readers can easily learn all they may wish to know of the great pessimist of Germany.

The Colours of Animals, their Meaning and Use, especially considered in the Case of Insects. By EDWARD BAGNALL POULTON. (International Scientific Series, Vol. LXVII.) New York, Appleton. 12°.

WITH this volume another new and valuable member is added to the classical International Scientific Series. It comes to us with the fascinating qualities which accurate and well-written accounts of animal life must have both for the general reader and the biologist. Mr. Poulton has given his book a general title, though it treats mainly of the origin of colors in insects, and more especially in moths and butterflies. This use of a general title may be excused on the ground that nearly all the difficulties in explaining the evolution of color in the animal world are met with among insects. After devoting an introductory chapter to the structures in animal tissues whereby colors are produced, the author proceeds to discuss the origin of colors by means of natural selection. Animal colors are classified as non-significant and significant; and the latter category is again subdivided into colors of direct physiological value to the organism (chlorophyl, pigment, etc.), colors of protective and aggressive resemblance, colors of protective and aggressive mimicry, warning colors, and colors displayed in courtship. Each of these classes of significant colors is then taken up in order, and discussed at length, with numerous illustrations drawn mainly from the group of lepidopterous insects. It is impossible in this brief notice to do full justice to the wealth of interesting examples with which the author presents us. Only a very small portion of the work deals with the hackneyed cases of mimicry and protective resemblance found in zoological text-books. Many of the observations are original, and others are taken from the recent works of reliable investigators. Perhaps the most original portion of the volume is that which treats of the author's own experiments on the chrysalides of the butterflies. He exposed larvae to surfaces of different colors during pupation, with results which may be briefly summarized in his own words:—

"I worked upon the allied small tortoise-shell butterfly (*Vanessa urticae*), which can be obtained in immense numbers. In the experiments conducted in 1886, over 700 chrysalides of this species were obtained, and their colors recorded. Green surroundings were first employed in the hope that a green form of pupa, unknown in the natural state, might be obtained. The results were, however, highly irregular, and there seemed to be no susceptibility to the color. The pupae were, however, somewhat darker than usual, and this result suggested a trial of black surroundings, from which the strongest effects were at once witnessed. The pupae were, as a rule, extremely dark, with only the smallest trace, and often no trace at all, of the golden spots which are so conspicuous in the lighter forms. These results suggested the use of white surroundings, which appeared likely to produce the most opposite effects. The colors of nearly 150 chrysalides obtained under such conditions were very surprising. Not only was the black coloring-matter as a rule absent, so that the pupae were light-colored, but there was often an immense development of the golden spots, so that in many cases the whole surface of the pupae glittered with an apparent metallic lustre. So remarkable was the appearance, that a physicist to whom I showed the chrysalides suggested that I had played him a trick, and had covered them with gold-leaf. These remarkable results led to the use of a gilt background as even more likely to produce and intensify the glittering appearance. . . . The results quite justified the reasoning; for a much higher percentage of gilded chrysalides, and still more remarkable individual instances, were obtained among the pupae which were treated in this way."

Warning colors are discussed at some length, and many interesting examples and experimental results adduced. There is a decided antithesis between warning and protective colors; as "the object of the latter is to conceal the possessor from its enemies, the object of the former is to render it as conspicuous as possible." It is shown that warning colors are usually accompa-

nied by a nauseating taste, strongly smelling or irritant fluids, etc. Attention is called to the fact that there is a general similarity in the warning colors of all animals, the prevalent patterns being alternating bands of striking colors, and that consequently enemies soon learn not to attack conspicuous and unusually colored animals, because a few experiments have taught them to associate these striking patterns with disagreeable tastes and odors.

In the chapter on mimicry, more examples, we think, might have been introduced. Many startling cases of *Hymenoptera* mimicked by *Diptera* seem to have escaped the author's notice. The classical case of South American heliconids and pierids, long since described by Bates, really merits fuller treatment than it has received on pp. 232, 233.

The work closes with several very interesting chapters on the colors used in courtship. This is perhaps the most interesting portion of the work, as it deals very successfully with a subject about which there is still wide difference of opinion among zoologists. Poulton takes his stand with Darwin, and maintains that the peculiar colors, appendages, etc., displayed during courtship by one of the sexes (usually the male) in the presence of the other, owe their origin to sexual selection. This differs from the standpoint taken by Wallace, who denies that the so-called secondary sexual characters thus originate. He maintains that they receive their explanation in natural selection pure and simple. It would be difficult, we believe, to explain many of the facts cited by Poulton, notably Peckham's observations on the courtship of spiders, from Wallace's standpoint.

At the end of the book is given a table illustrating the author's classification of animal colors. Although the Greek derivatives to designate the different uses of colors are well chosen, they will probably not be generally adopted. Zoologists will probably continue to speak of mimetic rather than pseudoposematic and pseudopepsimetic colors.

The text is provided with sixty six woodcuts and a chromolithographic frontispiece illustrating a remarkable case of mimicry in South African butterflies.

NOTES AND NEWS.

THE College of Physicians of Philadelphia announces that the next award of the Alvarenga prize, being the income for one year of the bequest of the late Senor Alvarenga, and amounting to about a hundred and eighty dollars, will be made on July 14, 1891. Essays intended for competition may be upon any subject in medicine, and must be received by the secretary of the college on or before May 1, 1891.

—A lady, writing to the *British Medical Journal*, says she recently heard a young girl of fourteen years "whistle," as her people called it; but "warble" it really was, for she kept her mouth slightly open, and the lips merely trembled, the notes being formed in the throat, the centre of it working as a bird's does when singing, and the sounds produced were exactly like those of blackbirds and thrushes. She warbled several airs to pianoforte accompaniments faultlessly, and most beautifully modulated; and so powerful were the notes, that her grandmother, who was excessively deaf, could catch every one, without the slightest effort, in another room a little distance off. In the same room some notes were deafening when she poured them out at the *forte* parts. She had been self-taught entirely from "whistling" to her dog and sitting in the window to "warble" to the birds.

—The flora of the Kutais and Tchernomorsk regions, on the eastern coast of the Black Sea, says M. Kuznetsoff in the "Izvestia" of the Russian Geographical Society (*Nature*, Nov. 6), belongs, as already known, to the Mediterranean region of evergreen trees. Next comes the region of West European flora, characterized by the extension of the beech-tree, and offering on the slopes of the mountains the very same subdivisions as one is accustomed to see in the Alps. That region extends over the provinces of Kuban and Terek as far east as the water-parting between the Terek and Sulak Rivers. The territory to the east of it was formerly thought to have a flora more akin to that of Asia, but a distinctly European flora appears again on the eastern slopes